

State of New Hampshire
Office of Energy and Planning
RE: Information related to State Energy Strategy
March 6, 2014

Dear Chairman Hatfield and Committee Members,

I am submitting for your consideration some articles which describe alternative energy resources being explored by other states in our region, and one which expresses a caution against becoming overly committed to natural gas as our energy savior.

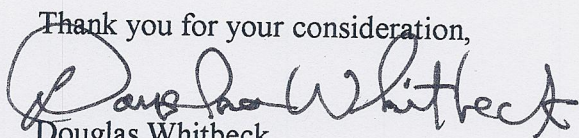
I like to compare using natural gas as a bridge to the camel's nose under the tent. If you aren't careful, soon you have the whole camel in the tent.

The argument then becomes that since we have invested so heavily in natural gas, we should continue in that direction to preserve our investment. Natural gas, of course, still contributes to climate change.

I would prefer to see the money that would be required to transition to natural gas be used to move directly to clean, renewable sources whenever possible. I must leave the technical presentation to others, but I would call your attention to House Bill 1312, Establishing a committee to study offshore wind energy and the development of other ocean power technology.

In the time I have spent in numerous public hearings with this Energy Advisory Council, I have been impressed and encouraged by the high level of technical awareness and concern demonstrated by Committee members for the future of our State.

Thank you for your consideration,



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RENEWABLES

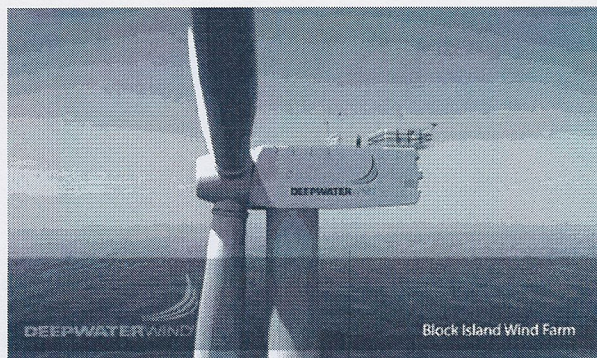
Key Turbine Deals Could Make Rhode Island Offshore Wind Farm the Nation's First

Brandon Baker | February 20, 2014 11:58 am | Comments

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There's clearly a lot of honor in being named the first offshore wind farm in the U.S., and developers keep that in mind with each deal they strike and announcement they make.

In the past two weeks, Deepwater Wind announced deals that it believes keeps its Block Island Wind Farm "on target to become the nation's first offshore wind farm." First, the Providence, RI-based firm signed a deal with the French Alstom Group for five, 6-megawatt (MW) turbines that will power the farm to be constructed on waters near Rhode Island's Block Island. Next, Deep Wind tapped Oslo, Norway-based Fred. Olsen Windcarrier to provide the vessel for the farm's turbine installation.



Video screenshot: Deepwater Wind

"This agreement represents a giant leap forward for the Block Island Wind Farm, and the start of turbine construction just last month marked a major project milestone," said Deepwater Wind CEO Jeffrey Grybowski.

Alstom's 6-MW Haliade 150 turbines are 589 feet tall. The company has 2.3 gigawatts of offshore wind farm substations delivered or under construction around the world.

The 30-MW Block Island Wind Farm will generate more than 125,000 MW hours annually, enough to power about 17,000 homes. The energy will be exported to the mainland electric grid through a 21-mile, bi-directional Block Island transmission system that includes a submarine cable proposed to make landfall in Narragansett, RI.

Grybowski also expressed pleasure with the support and security his company anticipates by qualifying for the federal Investment Tax Credit.

"Deepwater Wind's multi-million dollar payment to begin manufacturing our project's 15 blades ensures that our project will qualify for the federal Investment Tax Credit," Grybowski said. "When



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combined with engineering and permitting work we already completed, we're confident this payment puts us significantly over the required 5 percent 'safe harbor' for the ITC."

Last year, the Earth Policy Institute listed Block Island as one of the candidates for the nation's first offshore farm. One of the others, the Cape Wind Farm in Massachusetts, has faced legal setbacks from opposers for years.

Wind energy advocates have called for businesses to establish a market in the U.S. On the West Coast, a pilot project plan off Coos Bay in Oregon earned approval for the construction of a five-turbine, 30-MW farm.

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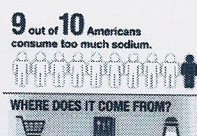
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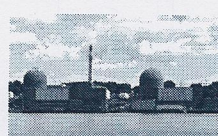
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Our Mission: Unify and network the wind industry in Maine to expand our contribution to the world market.

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MOWII Membership Information

MOWII Goals and Objectives:

- Organize Maine wind industry interests
- Act as a knowledge transfer network linking opportunities to Maine companies
- Relate industry needs to the state and federal government
- Act as a communication hub, representing our Maine-based industrial partners in the wind energy industry

MOWII is working for you!!!



What's New

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- Maine Wind & Ocean News Wrap up for Feb-March 2014
03/07/2014 - 11:01am
- Wrap up of Maine Wind and Ocean Energy News for Jan-Feb 2014
02/05/2014 - 3:54pm
- Mechanical Engineering Faculty Position open at U-Maine
01/15/2014 - 1:59pm
- News round up for December 2013-January 2014
01/08/2014 - 9:54pm
- Maine Company to build the first US Offshore Wind Electrical Service Platform
12/23/2013 - 11:12am
- Maine Wind & Ocean Energy News Round up for Nov-Dec 2013
12/05/2013 - 2:58pm
- Maine Wind and Ocean Energy News Wrap up for Oct-Nov 2013
11/20/2013 - 4:24pm
- Maine Ocean & Wind News Round up for September to October 213
10/02/2013 - 2:45pm
- Me Wind & Ocean News Wrap up for August 2013
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- Maine Ocean & Wind News Round Up for July 2013
08/13/2013 - 1:43pm

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03/11/2014 - 10:00am
To: 03/11/2014 - 10:45am
- "YOUR FUTURE IS HERE" 2014
Manufacturing Summit
03/13/2014 - 8:00am
To: 03/13/2014 - 3:00pm
- Northeast Wind Supply Chain Workshop
03/25/2014 - 9:00am
To: 03/25/2014 - 12:00pm
- AWEA Northeast Wind Summit
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USA: Offshore Wind – One of the Coolest Technologies to Be Seen ...

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USA: **Maine** Aqua Ventus I Gets Green Light >> Offshore Wind

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Summary of the Offshore Wind Report from the Advanced Structures & Composites Center's February 23, 2011 Press Release:

"Funded by more than \$1 million from the U.S. Department of Energy and compiled by the University of Maine and the James W. Sewall Company, the report examines economics and policy, electrical grid integration, wind and wave, bathymetric, soil, and environmental research. It also includes summaries of assembly and construction sites, critical issues for project development and permitting, and an analysis of the implications of the Jones Act.

That federal law, in place for nearly a century, would cause deepwater offshore wind facilities to be identified as ports. Some believe that designation might make it difficult for developers to work with European collaborators, but the new report explains how that issue can be effectively managed.

The Maine Offshore Wind Report reflects the compiled efforts of a team of contributors organized by UMaine's Advanced Structures and Composites Center. This team includes the University of Maine, James W. Sewall Company; RLC Engineering; Vienna Ventures; W.F. Baird & Associates Coastal Engineers Ltd.; Kleinschmidt Associates; Bernstein, Shur, Sawyer, & Nelson, P.A.; Island Institute; Maine Composites Alliance; Maine Wind Industry Initiative; and Black & Veatch Corporation."

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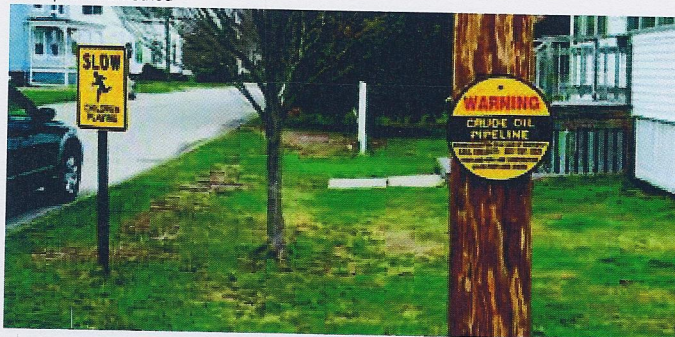
TAR SANDS FACTS

© David Dodge, The Canadian Parks and Wilderness Society



By June 2009, tar sands mining operations had destroyed an area of the Boreal forest one and half times the size of Denver, Colorado.

© Stephen Demetriou



The Portland-Montreal pipeline flows underground through dozens of communities throughout New England and Central Canada.

Going in Reverse: The Tar Sands Oil Threat to Central Canada and New England

Canadian pipeline company Enbridge Inc. appears to be reviving a previous plan, called Trailbreaker, which would transport tar sands oil through some of the most important natural and cultural landscapes in eastern Canada and Vermont, New Hampshire, and Maine. The Trailbreaker plan would reverse the direction of oil flowing through two major pipelines—Enbridge Line 9 and the Portland/Montreal Pipeline. But under the plan, the pipelines would not carry conventional oil, but Canadian tar sands oil—the dirtiest oil on the planet—along an approximately 750-mile route. The pipelines' route would run east through Ontario and Quebec, and down to the New England seacoast, finally ending in Portland, Maine's Casco Bay for export. Enbridge has taken the first step to implement this plan by recently filing a permit application with Canada's National Energy Board.

The removal of tar sands oil from the ground is a destructive business. Large swaths of Alberta's Boreal forest are destroyed, and a massive amount of energy creating carbon pollution is used to produce the heavy oil. Because of the corrosive qualities of tar sands oil, its transport poses unique risks that aging conventional oil pipeline systems, like Trailbreaker, are not equipped to handle. A spill along Trailbreaker's corridor could harm rivers, lakes, and bays that are vital resources for millions of people in Canada and the United States, especially given that tar sands oil spills are more prevalent and potentially more damaging than conventional oil spills. One thing is certain—eastern Canada and New England do not need to bear the risks of tar sands pipelines so that the oil industry can gain access to a coast for export.

TRAILBREAKER—A PIECEMEAL PIPELINE

A few years ago, the oil industry proposed the Trailbreaker tar sands pipeline, a project that would link the Midwestern pipeline system through Ontario and Quebec and across New England to Portland, Maine where tar sands would go on tankers to refineries in the Gulf Coast or overseas. That plan was eventually shelved and then in August of 2011, Enbridge filed a permit application with the Canadian National Energy Board for a project they call "Line 9 Reversal Phase I."¹ The permit for this project seeks to reverse the flow direction of about one quarter of Line 9's length—from Sarnia, Ontario, to the Westover Oil Terminal, which is located outside of Hamilton, Ontario. Although Enbridge has claimed this is a standalone project, the application appears to signal the rebirth of Trailbreaker.

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The Plan to Pump Tar Sands Through Eastern Canada and New England



By dividing up the project into smaller components and calling it “Phase I,” Enbridge could be attempting to shield itself from the type of scrutiny faced by tar sands pipelines like TransCanada’s Keystone XL. Enbridge acknowledged in late 2011 that they were actively pursuing plans to bring tar sands to Ontario, Quebec, and New England.²

THE TROUBLE WITH TAR SANDS

The oil in Alberta does not flow freely from the ground like the gushers portrayed in the movies. Instead, the extraction and processing of tar sands oil is one of the largest industrial operations in the world, relying on two processes—open-pit mining and in-situ drilling—that raze and fragment massive swaths of the Boreal forest. These processes use enough energy to make tar sands oil production the fastest-growing contributor to Canada’s carbon pollution.³

At the open-pit mines, the Boreal forest is cleared so that massive excavators and trucks can scoop up and remove the tar sands. At the in-situ drilling operations, the forest is fragmented and natural gas is burned to produce steam, which is injected via pipes into the ground to melt the subterranean tar sands. The oil gathers in wells and is pumped up to the surface for processing.

Destroying carbon-storing trees and wetlands on such a large scale contributes to climate change. Carbon pollution from tar sands extraction and upgrading are estimated to be three to five times higher per barrel than production of a barrel of conventional Canadian or U.S. crude. Tar sands extraction wipes out nesting habitat for millions of birds, such as the evening grosbeak and olive-sided flycatcher. Tar sands mining operations require between two to four barrels of fresh water for every barrel of oil produced. In addition, toxic tar sands tailings ponds now cover 170 square kilometers of Alberta, an area the size of Vancouver or Washington, D.C.

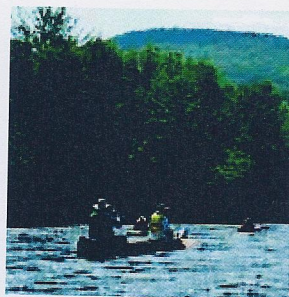
SAFETY RISKS FROM TAR SANDS PIPELINES AND SPILLS

Tar sands oil or bitumen mined or drilled from the Alberta soil needs thinning to be transported in pipelines. After the oil-laden soil is removed, tar sands are blended with natural gas liquids or other light, volatile petroleum products that contain benzene, toluene, and xylene. The result—diluted bitumen—is a viscous, heavy crude oil that at high pressures can be pumped through pipelines.

Tar sands diluted bitumen has organic acid concentrations up to 20 times higher than conventional crude oil, and it contains 10 times more sulfur.⁴ Diluted bitumen is also 40 to 70 times more viscous than conventional crude oil. As diluted bitumen is pumped through pipelines, its temperature increases, amplifying the corrosive qualities of an acidic oil that has abrasive materials such as quartz and silicates suspended in the mixture. In a sense, tar sands oil that flows through a pipeline is like fast, hot, and toxic liquid sandpaper.

Tar sands pipeline spills can and do occur, and there are indications that they are more prevalent than conventional oil spills. In recent years, the majority of tar sands oil not refined in Alberta has been piped south to refineries in the United States, especially to Midwestern pipelines, which have the longest history of transporting Canadian tar sands oil, and between 2007 and 2010, pipelines in North Dakota, Minnesota, Wisconsin, and Michigan spilled almost three times as much crude oil per mile of pipeline when compared to the U.S. national average.⁵

The damage can be more severe when an oil spill involves tar sands diluted bitumen. The natural gas condensate used to thin tar sands oil increases the chance of explosions if it comes into contact with high heat, sparks, static electricity, or lightning. Also, toxins that are present in the oil, such as benzene and n-hexane, can affect the human central nervous system.



© Jesse Seymour-Perkins

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A spill along the Trailbreaker pipeline route could harm a number of important natural resources areas in Ontario, Quebec, and northern New England.

Tar sands diluted bitumen spills can be especially destructive to bodies of water, where protracted and costly cleanup efforts are required. If a diluted bitumen spill occurs by a river, pond, lake, bay, or sea, the diluents will evaporate, leaving the heavier bitumen to sink. This means that cleanup efforts not only require booms to skim spilled oil from the water's surface, they also require dredges to recover sunken bitumen, potentially agitating toxic sediments that have already settled on the bottom.

A recent tar sands spill in Michigan shows how devastating a diluted bitumen spill can be. In the summer of 2010, more than 800,000 gallons gushed from an Enbridge pipeline in the southern part of the state. The oil contaminated a 30-mile stretch of the Kalamazoo River, which required extensive dredging and also led to widespread health problems in neighboring communities.

The risk of spills from Trailbreaker would be greater because of the age of the pipelines in question. Enbridge Line 9 was built in 1975, and one of the pipelines on the Portland/Montreal corridor was built in 1950.

A spill along Trailbreaker's corridor could harm rivers, lakes, and bays that are vital resources for millions of people in Canada and the United States.



© NTSB

In 2010, a rupture in an Enbridge Inc. pipeline near Marshall, Michigan resulted in the largest tar sands spill in U.S. history.

SPECIAL PLACES AT RISK

Along Trailbreaker's route, tar sands oil pipelines could put several special places at risk, including:

- **Grand River Basin**, a designated Canadian Heritage River, recognized for its natural and cultural attributes of national stature and as home to more than 215 species designated at-risk or endangered species.
- **Lake Ontario**, the last in the Great Lakes chain and an important resource to the millions of Canadians and Americans who live on or near its shores.
- **Saint Lawrence River**, the most important river in eastern Canada as it provides everything from half of Quebec's drinking water to a seasonal home for blue whales, the largest creatures on the planet.
- **Victory State Forest**, a unique northern Vermont habitat for moose and locally uncommon boreal birds.
- **Connecticut River**, a 400-mile waterway that drains one-third of New England's landscape and boasts important cultural and ecological histories.
- **Androscoggin River**, a popular waterway that flows through New Hampshire and across Maine, attracts whitewater kayakers and fly-fishermen, as well as black bears, moose, and bald eagles.
- **Sebago Lake**, home to a native species of landlocked Atlantic salmon and the major drinking water resource for greater Portland, Maine's largest metropolitan area.
- **Casco Bay**, a large, rich estuary near Portland, Maine that is home to a variety of coastal natural resources and a thriving marine economy.

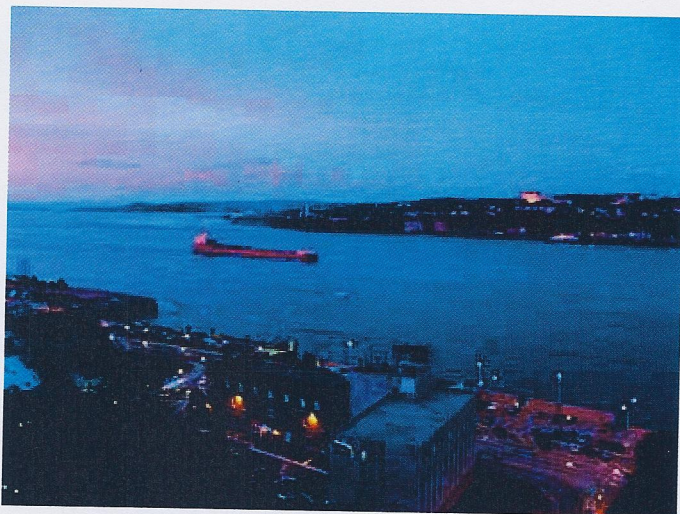


Toxic tailings ponds created by tar sands mining operations cover an area the size of Vancouver or Washington, D.C.

THE NEED TO PROTECT PUBLIC SAFETY AND THE ENVIRONMENT

In the absence of specialized regulations, the rapid growth of tar sands oil pipeline development in Canada and the United States necessitates a close examination of any oil pipeline proposal. The following steps are required to protect public safety and the environment from the potentially dangerous impacts of tar sands oil pipelines:

- Canada's National Energy Board should consider Enbridge's Line 9 reversal permit application as part of a long-term plan to bring tar sands oil east from Alberta to Ontario, Quebec, and New England.
- Governments in Canada and the United States should complete more thorough reviews of plans to transport tar sands oil through eastern Canada and New England. Included in the reviews should be impacts on environmental and public health, and the effects of potential oil spills.



The Trailbreaker pipeline crosses the Saint Lawrence River, which provides drinking water for nearly 50 percent of Quebec's population.

- Governments in Canada and the United States should evaluate the need for new safety regulations for tar sands pipelines.
- Eastern provinces like Quebec and Ontario and states in New England should devise long-range clean energy plans, including the adoption of a clean fuels standard, before committing to large-scale infrastructure projects that would increase oil consumption.
- Governments at all levels in both Canada and the United States should evaluate policies that would reduce oil demand.

1 National Energy Board Filing Receipt, Filing ID No. A30643, August 8, 2011, https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/90464/90552/92263/706191/706437/706045/A2C0W8_-_Receipt.html?nodeid=706017&vernum=0 (accessed April 10, 2012).

2 Brad Olson and Jeremy van Loon, "Enbridge Talking with Valero on East Coast Pipeline Reversal," *Bloomberg*, October 5, 2011, <http://www.bloomberg.com/news/2011-10-06/enbridge-talking-with-valero-on-east-coast-pipeline-reversal.html> (accessed April 17, 2012).

3 Mark Huot, "Oilsands and climate change," The Pembina Institute, September 2011, p. 1, <http://www.pembina.org/pub/2262> (accessed April 10, 2012).

4 Gareth Crandall, "Non-Conventional Oil Market Outlook," p. 4, Presentation to IEA Conference on Non-Conventional Oil, 2002.

5 North Dakota, Minnesota, Wisconsin, and Michigan have approximately 5,475 miles of crude pipeline, or about 10.9 percent of the U.S. total. U.S. Department of Transportation, PHMSA, State Mileage by Commodity Statistics, 2011, http://primis.phmsa.dot.gov/comm/reports/safety/MI_detail1.html?nocache=8335#_OuterPanel_tab_4 (accessed April 10, 2012). Bureau of Transportation and Labor Statistics, Table 1-10: U.S. Oil and Gas Pipeline Mileage, 2009, http://www.bts.gov/publications/national_transportation_statistics/html/table_01_10.html (accessed April 10, 2012). Meanwhile, between 2007 and 2010 crude pipelines in North Dakota, Minnesota, Wisconsin, and Michigan spilled 38,220 barrels of crude, or 30.3 percent of the 125,862 barrels of crude spilled in the United States.

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Gangplank to a Warm Future

By ANTHONY R. INGRAFFEA

Published: July 28, 2013 234 Comments

ITHACA, N.Y. — MANY concerned about climate change, including President Obama, have embraced hydraulic fracturing for natural gas. In his recent climate speech, the president went so far as to lump gas with renewables as “clean energy.”

Related in Opinion

Dot Earth Blog: Another View on Gas Drilling in the Context of Climate Change (July 29, 2013)

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Opinion

As a longtime oil and gas engineer who helped develop shale fracking techniques for the Energy Department, I can assure you that this gas is not “clean.” Because of leaks of methane, the main component of natural gas, the gas extracted from shale deposits is not a “bridge” to a renewable energy future — it’s a gangplank to more warming and away from clean energy investments.

Methane is a far more powerful greenhouse gas than carbon dioxide, though it doesn’t last nearly as long in the atmosphere. Still, over a 20-year period, one pound of it traps as much heat as at least 72 pounds of carbon dioxide. Its potency declines, but even after a century, it is at least 25 times as powerful as carbon dioxide. When burned,

natural gas emits half the carbon dioxide of coal, but methane leakage eviscerates this advantage because of its heat-trapping power.

And methane is leaking, though there is significant uncertainty over the rate. But recent measurements by the National Oceanic and Atmospheric Administration at gas and oil fields in California, Colorado and Utah found leakage rates of 2.3 percent to 17 percent of annual production, in the range my colleagues at Cornell and I predicted some years ago. This is the gas that is released into the atmosphere unburned as part of the hydraulic fracturing process, and also from pipelines, compressors and processing units. Those findings raise questions about what is happening elsewhere. The Environmental Protection Agency has issued new rules to reduce these emissions, but the rules don’t take effect until 2015, and apply only to new wells.

A 2011 study from the National Center for Atmospheric Research concluded that unless leaks can be kept below 2 percent, gas lacks any climate advantage over coal. And a study released this May by Climate Central, a group of scientists and journalists studying climate change, concluded that the 50 percent climate advantage of natural gas over coal is unlikely to be achieved over the next three to four decades. Unfortunately, we don’t have that long to address climate change — the next two decades are crucial.

To its credit, the president’s plan recognizes that “curbing emissions of methane is

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critical." However, the release of unburned gas in the production process is not the only problem. Gas and oil wells that lose their structural integrity also leak methane and other contaminants outside their casings and into the atmosphere and water wells. Multiple industry studies show that about 5 percent of all oil and gas wells leak immediately because of integrity issues, with increasing rates of leakage over time. With hundreds of thousands of new wells expected, this problem is neither negligible nor preventable with current technology.

Why do so many wells leak this way? Pressures under the earth, temperature changes, ground movement from the drilling of nearby wells and shrinkage crack and damage the thin layer of brittle cement that is supposed to seal the wells. And getting the cement perfect as the drilling goes horizontally into shale is extremely challenging. Once the cement is damaged, repairing it thousands of feet underground is expensive and often unsuccessful. The gas and oil industries have been trying to solve this problem for decades.

The scientific community has been waiting for better data from the E.P.A. to assess the extent of the water contamination problem. That is why it is so discouraging that, in the face of industry complaints, the E.P.A. reportedly has closed or backed away from several investigations into the problem. Perhaps a full E.P.A. study of hydraulic fracturing and drinking water, due in 2014, will be more forthcoming. In addition, drafts of an Energy Department study suggest that there are huge problems finding enough water for fracturing future wells. The president should not include this technology in his energy policy until these studies are complete.

We have renewable wind, water, solar and energy-efficiency technology options now. We can scale these quickly and affordably, creating economic growth, jobs and a truly clean energy future to address climate change. Political will is the missing ingredient. Meaningful carbon reduction is impossible so long as the fossil fuel industry is allowed so much influence over our energy policies and regulatory agencies. Policy makers need to listen to the voices of independent scientists while there is still time.

Anthony R. Ingraffea is a professor of civil and environmental engineering at Cornell University and the president of Physicians, Scientists and Engineers for Healthy Energy, a nonprofit group.

A version of this op-ed appeared in print on July 29, 2013, on page A17 of the New York edition with the headline: Gangplank To a Warm Future.

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Danram Dallas, TX

Here's a bit of science for you, Clyde:

The British Meteorological Society recently admitted ... grudgingly ... that there has been no net warming of the Earth for the last 16 years. This means that the period of "no warming" now actually exceeds the period of "warming" upon which this entire hoax has been based.

The fact is that the actual increase in CO₂ content of the atmosphere ... about 100 parts per million ... only accounts for about 1/100th of 1 percent of our planet's total atmosphere.

Now, if you truly believe that a change of 1/100th of 1 percent in the composition of Earth's atmosphere can, in and of itself, cause the planet to heat up, then I've got a bridge in Brooklyn that I need to sell.

In reply to Clyde Wynant July 29, 2013 at 10:32 a.m. RECOMMENDED 12

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